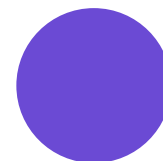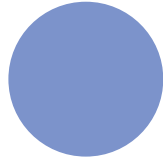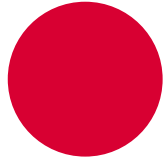# Edmonton Obesity Staging System for Adults and Pediatrics

National Academies - Roundtable On Obesity Solutions

Geoff Ball, PhD, RD

Professor and Associate Chair (Research), Department of Pediatrics

Faculty of Medicine & Dentistry, College of Health Sciences

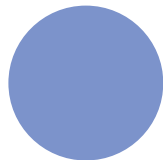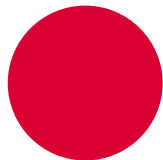University of Alberta, Edmonton, AB

Canada

Land Acknowledgement

The **University of Alberta** is located on Treaty 6 territory, and respects the histories, languages, and cultures of **First Nations, Metis, Inuit, and all First Peoples of Canada**, whose presence continues to enrich our vibrant community.

Disclosures

- Novo Nordisk National Advisory Committee on Pediatric Obesity
- Research funding:
    - Women and Children's Health Research Institute (UAlberta)
    - Canadian Paediatric Surveillance Program
    - Canadian Institutes of Health Research
    - Public Health Agency of Canada
    - Alberta Health Services

Objectives

1. Provide an overview of the Edmonton Obesity Staging System (EOSS) for Adults and Pediatrics (EOSS-P)

2. Describe how EOSS-P has been applied to date
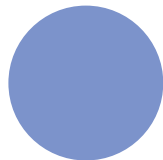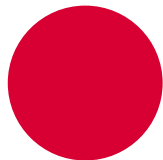
Dr. Arya Sharma

University of Alberta (retired) /
Obesity Canada

Berlin, Germany

Dr. Stasia Hadjiyannakis

Children's Hospital of Eastern
Ontario / University of Ottawa

Ottawa, Canada

REVIEW

# A proposed clinical staging system for obesity

AM Sharma[1] and RF Kushner[2]

Table 4 Proposed clinical and functional staging of obesity

Stage	Description	Management
0	No apparent obesity-related risk factors (e.g., blood pressure, serum lipids, fasting glucose, etc. within normal range), no physical symptoms, no psychopathology, no functional limitations and/or impairment of well being	Identification of factors contributing to increased body weight. Counseling to prevent further weight gain through lifestyle measures including healthy eating and increased physical activity.
1	Presence of obesity-related subclinical risk factors (e.g., borderline hypertension, impaired fasting glucose, elevated liver enzymes, etc.), mild physical symptoms (e.g., dyspnea on moderate exertion, occasional aches and pains, fatigue, etc.), mild psychopathology, mild functional limitations and/or mild impairment of well being	Investigation for other (non-weight related) contributors to risk factors. More intense lifestyle interventions, including diet and exercise to prevent further weight gain. Monitoring of risk factors and health status.
2	Presence of established obesity-related chronic disease (e.g., hypertension, type 2 diabetes, sleep apnea, osteoarthritis, reflux disease, polycystic ovary syndrome, anxiety disorder, etc.), moderate limitations in activities of daily living and/or well being	Initiation of obesity treatments including considerations of all behavioral, pharmacological and surgical treatment options. Close monitoring and management of comorbidities as indicated.
3	Established end-organ damage such as myocardial infarction, heart failure, diabetic complications, incapacitating osteoarthritis, significant psychopathology, significant functional limitations and/or impairment of well being	More intensive obesity treatment including consideration of all behavioral, pharmacological and surgical treatment options. Aggressive management of comorbidities as indicated.
4	Severe (potentially end-stage) disabilities from obesity-related chronic diseases, severe disabling psychopathology, severe functional limitations and/or severe impairment of well being	Aggressive obesity management as deemed feasible. Palliative measures including pain management, occupational therapy and psychosocial support.

EOSS　　　　**BMI Class**
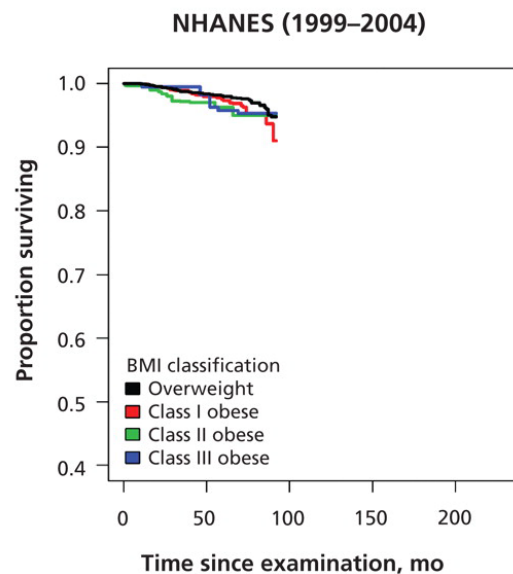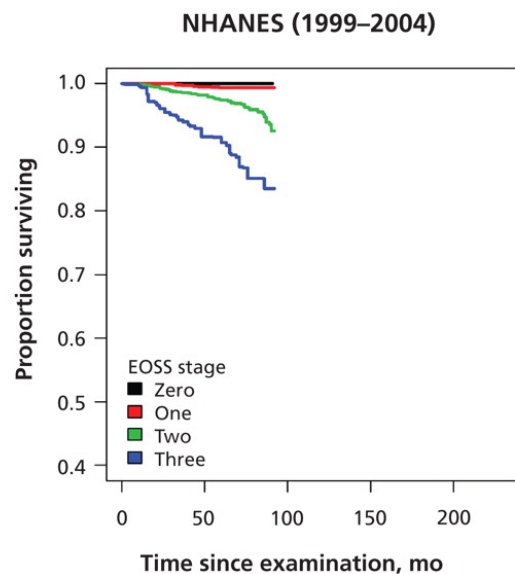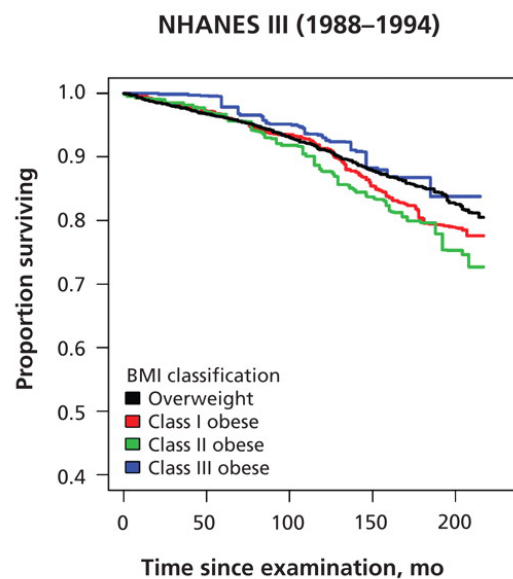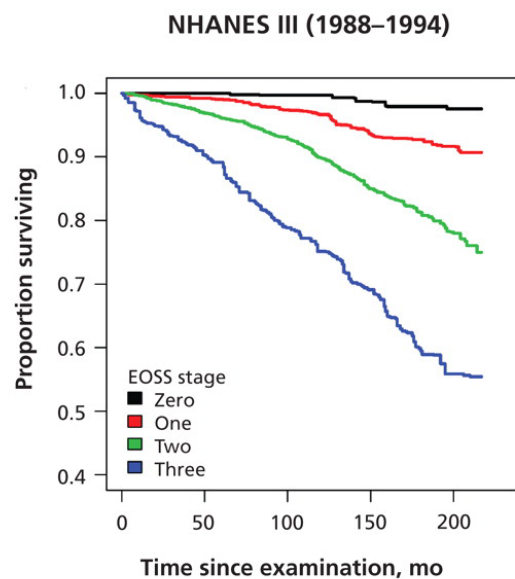
Using the Edmonton obesity staging system to predict mortality in a population-representative cohort of people with overweight and obesity

Raj S. Padwal MSc MD, Nicholas M. Pajewski PhD, David B. Allison PhD, Arya M. Sharma MD PhD
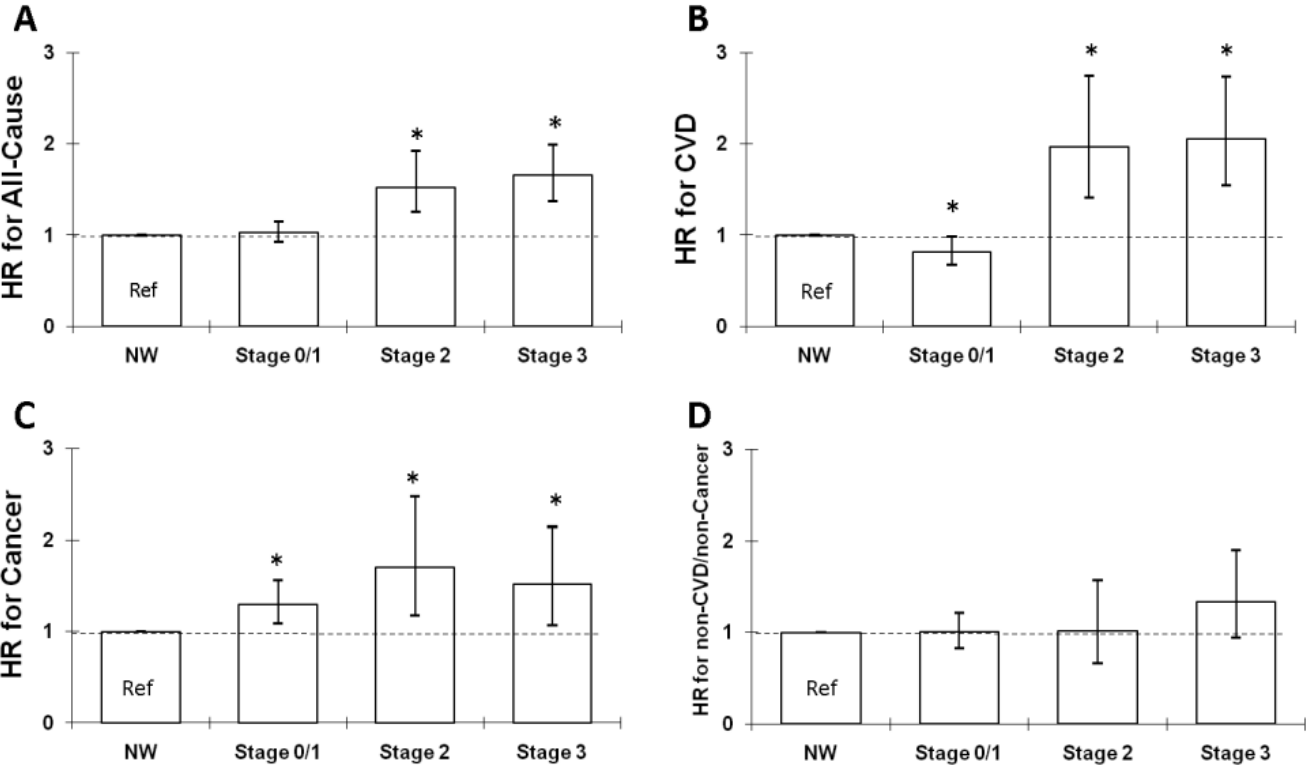
CMAJ 183: E1059-E1066 (2011)

Survival curves diverged when stratified by EOSS score, but not obesity (BMI) class
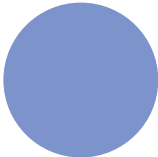
Edmonton Obesity Staging System: association with weight history and mortality risk

Jennifer L. Kuk, Chris I. Ardern, Timothy S. Church, Arya M. Sharma, Raj Padwal, Xuemei Sui, and Steven N. Blair

Hazard ratios increase across increasing EOSS scores for all-cause mortality, CVD, and cancer

Fig. 1. Association between Edmonton Obesity Staging System (EOSS) stage and risk of all-cause (A), cardiovascular disease (CVD) (B), cancer (C), and non-CVD or noncancer mortality (D) in men and women. Adjusted for age, sex, smoking status, exam year, low fitness, dieting, and adequate fruit and vegetable consumption. *$p < 0.05$. HR, hazard ratio; NW, normal weight.

The Edmonton Obesity Staging System for Pediatrics: A proposed clinical staging system for paediatric obesity

Stasia Hadjiyannakis MD[1,2], Annick Buchholz PhD CPsych[2,3], Jean-Pierre Chanoine MD PhD[4], Mary M Jetha MD[5,6], Laurie Gaboury PhD RPsych[6], Jill Hamilton MD[7], Catherine Birken MD MSc[7], Katherine M Morrison MD[8], Laurent Legault MD[9], Tracey Bridger MD[10], Stephen R Cook MD MPH[11], John Lyons PhD[12], Arya M Sharma MD PhD[13], Geoff DC Ball PhD RD[5,6]
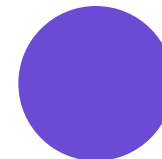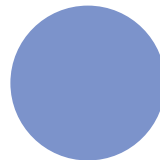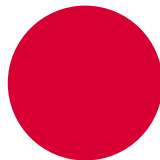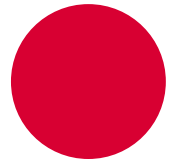
The 4Ms of EOSS-P
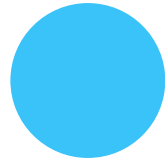
● Mental Health

● Metabolic Health
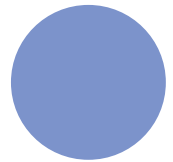
● Mechanical Health
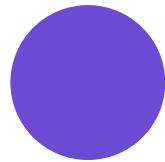
● Milieu (Social) Health

The 4Ms of EOSS-P

Mental Health	Mechanical Health	Metabolic Health	Milieu (Social) Health
Anxiety	Sleep apnea	IGT/T2DM	Parent health/disability
Depression	MSK pain	Dyslipidemia	Family stressors
Body image	Reflux disease	Hypertension	Family income
ADHD	Stress incontinence	Fatty liver	Bullying/Stigma
Learning disorder	Encopresis	Gallstones	School attendance
Sleep disorder	Intertrigo	PCOS	School support
Eating disorder		Medication	Neighborhood safety
Trauma		Genetics	Medical insurance
			Accessible facilities
			Food environment
			Opportunities for physical activity

EOSS-P:

Edmonton
Obesity
Staging
System for
Pediatrics

Staging Tool

Stage 0

- *Metabolic*: No metabolic abnormalities
- *Mechanical:* No functional limitations
- *Mental:* No psychopathology
- *Milieu:* No parental, familial or social environment concerns

Stage 1

- *Metabolic*: Sub-clinical risk factors (Acanthosis Nigricans, pre- hypertension, IFG/IGT, mild lipid abnormalities, mild elevation in transaminases, mild to moderate fatty infiltration of liver)
- *Mechanical:* Mild obstructive sleep apnea (OSA) not requiring therapy, mild musculoskeletal (MSK) pain, and/or dyspnea not interfering with activities of daily living (ADL)
- *Mental:* Mild psychopathology, ADHD, learning disability, mild body image pre-occupation, occasional emotional/binge eating, bullying, mild developmental delay
- *Milieu:* Minor problems in relationships, minor limitations in caregivers' ability to support children's needs

Stage 2

- *Metabolic*: Type 2 diabetes, hypertension, moderate lipid abnormalities, moderate elevation of transaminases and/or severe fatty infiltration of liver, PCOS, asymptomatic gall stones
- *Mechanical:* OSA requiring therapy, gastroesophageal reflux, MSK pain limiting activity, moderate limitations in ADL
- *Mental:* Major depression, anxiety, school absenteeism, frequent binging, significant bullying (school or home), significant body image disturbance, moderate developmental delay
- *Milieu:* Moderate problems in relationships, significant limitations in caregivers' ability to support children's needs

Stage 3

- *Metabolic*: Uncontrolled type 2 diabetes (+/- complications), hypertension, FSGS, markedly elevated liver enzymes and/or liver dysfunction, symptomatic gall stones, marked lipid abnormalities
- *Mechanical:* OSA requiring PAP therapy and suppl. oxygen, limited mobility, shortness of breath sitting/sleeping
- *Mental:* Uncontrolled psychopathology, school refusal, daily binge eating, severe body image disturbance
- *Milieu:* Severe problems in relationships, caregivers unable to support children's needs; may include exposure to family violence, dangerous environment (home, neighbourhood, school)

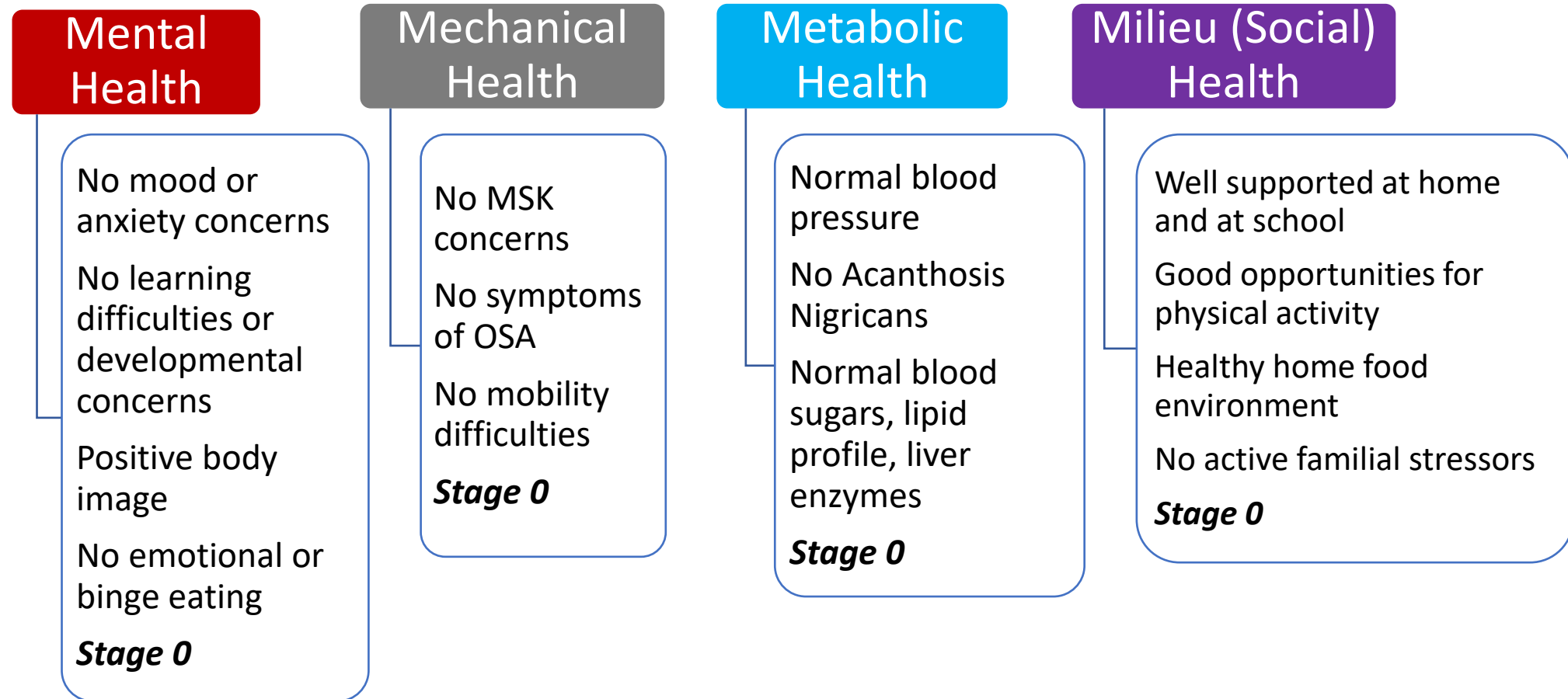**Obesity Class**
BMI Percentiles
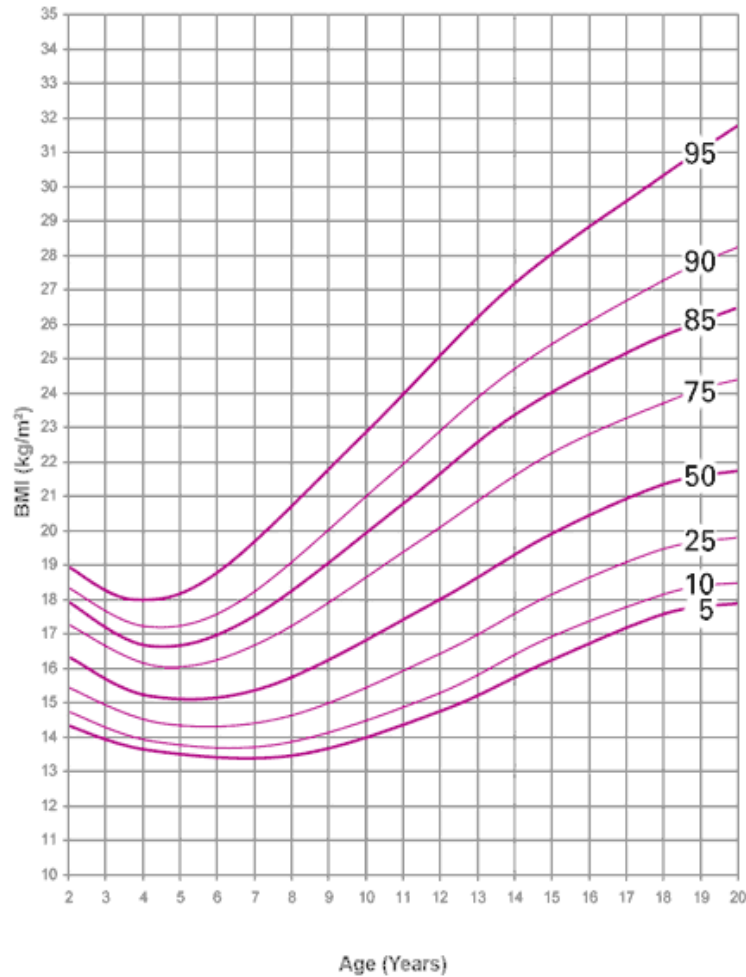
EOSS-P

0 No Apparent Risk Factors

1 Subclinical Risk Factors

2 Chronic Disease Present

3 Uncontrolled Chronic Disease

Case #1: 12-year-old boy with severe obesity (BMI z-score: 3.4)

Mental Health

No mood or anxiety concerns

No learning difficulties or developmental concerns

Positive body image

No emotional or binge eating

Stage 0

Mechanical Health

No MSK concerns

No symptoms of OSA

No mobility difficulties

Stage 0

Metabolic Health

Normal blood pressure

No Acanthosis Nigricans

Normal blood sugars, lipid profile, liver enzymes

Stage 0

Milieu (Social) Health

Well supported at home and at school

Good opportunities for physical activity

Healthy home food environment

No active familial stressors

Stage 0

EOSS-P: Stage 0

Case #2: 12-year-old boy with severe obesity (BMI z-score: 3.4)

Mental Health

ADHD

Non-verbal learning disorder

Stage 1

Mechanical Health

No MSK concerns

No symptoms of OSA

No mobility difficulties

Stage 0

Metabolic Health

Type 2 Diabetes without complications

Stage 2

Milieu (Social) Health

Significant bullying leading to school refusal

Socially isolated

Unsafe neighborhood
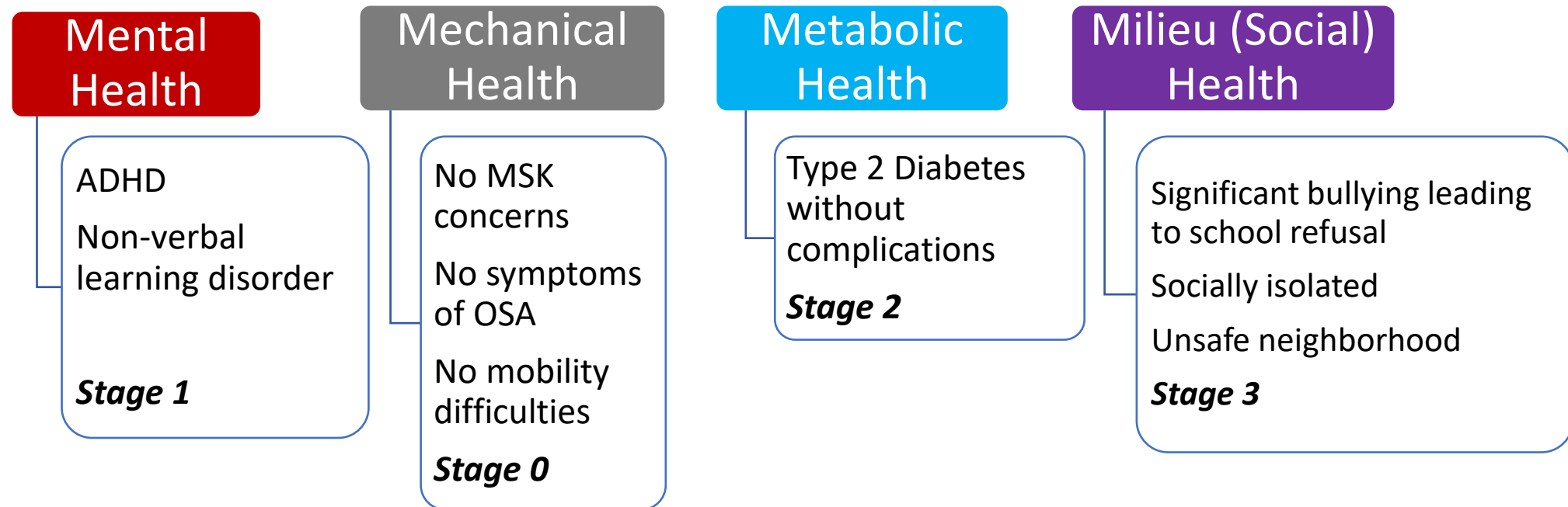
Stage 3

EOSS-P: Stage 3

Obesity class versus the Edmonton Obesity Staging System for Pediatrics to define health risk in childhood obesity: results from the CANPWR cross-sectional study

Stasia Hadjiyannakis, Quazi Ibrahim, Jenifer Li, Geoff D C Ball, Annick Buchholz, Jill K Hamilton, Ian Zenlea, Josephine Ho, Laurent Legault, Anne-Marie Laberge, Lehana Thabane, Mark Tremblay, Katherine M Morrison

- Cross-sectional study (n=847 children with obesity)

- Participants enrolled in the Canadian Weight Management Registry (CANPWR), representing 10 multidisciplinary pediatric weight management clinics in Canada

- Participants were classified into WHO BMI classes and staged using the EOSS-P

- Associations of BMI class with EOSS-P stage were examined
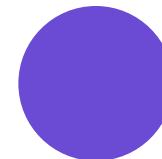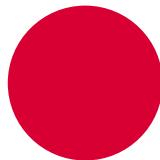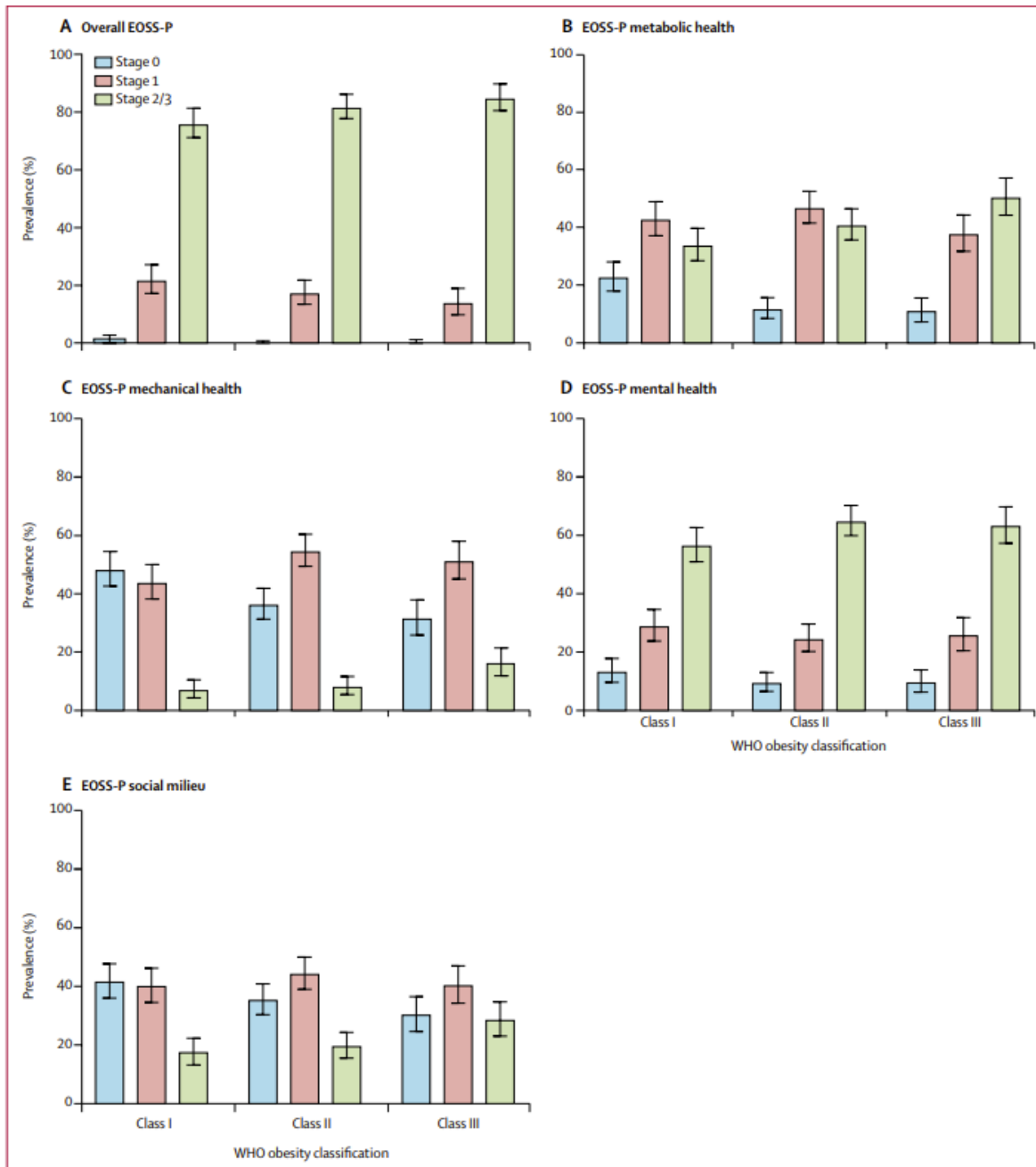
- Mental Health concerns were the most common health concern for children presenting to pediatric obesity management clinics

- Metabolic and Mental Health issues were equally distributed across BMI classes

- Social Milieu and Mechanical Health challenges were more common in those with class III obesity

- BMI class alone would have underestimated disease burden in some and overestimated disease burden in others

- Arya Sharma and Stasia Hadjiyannakis

- Katherine Morrison, McMaster University (CANPWR)

- Canadian Institutes of Health Research

- Alberta Health Services Chair in Obesity Research